Environmental Waste Management Associates

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By Regular Mail

February 14, 2002

Mr. Richard Ho
Remedial Project Manager
USEPA – Region 2
Emergency & Remedial Response Division
290 Broadway, Floor 19
New York, NY 10007-1866

Re: Former Celotex Industrial Park
River Road, Edgewater, NJ
EWMA Project #200957

Dear Mr. Ho:

Per your request, please find enclosed for your use one copy of the Soils and Foundation Investigation Report for the referenced site, completed by Melick-Tully and Associates, dated October 19, 2000

Respectfully,
Environmental Waste Management Associates, LLC

Burton Turner, PE, PG
Senior Project Engineer

Enclosure

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REPORT
SOILS AND FOUNDATION INVESTIGATION

PROPOSED GLENWOOD MALL PROMENADE
EDGEWATER, NEW JERSEY
G. HELLER ENTERPRISES, INC.

October 19, 2000

Prepared By:
Melick-Tully and Associates, P.C.
117 Canal Road
South Bound Brook, NJ 08880
Tel: 732-356-3400 Fax: 732-356-9054

MTA Project No. 4735-036*01

MELICK-TULLY AND ASSOCIATES, P.C.
GEOTECHNICAL ENGINEERS AND ENVIRONMENTAL CONSULTANTS

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October 19, 2000

G. Heller Enterprises, Inc.
525 River Road
Edgewater, New Jersey 07020

Attention: Mr. Richard LaBarbiera

Gentlemen:

Report
Soils and Foundation Investigation
Proposed Glenwood Mall Promenade
Edgewater, New Jersey
G. Heller Enterprises, Inc.

Introduction

In this report, we present the result of a soils and foundation investigation performed for the proposed promenade to be constructed at the Glenwood Mall in Edgewater, New Jersey. The mall will be located on the east side of relocated River Road to the north of the Gorge Road intersection. The property is bounded on the east by the Hudson River.

At the present time, a large multi-screened theater is being constructed in the north-central portion of the proposed site. We understand that the southern portion of the site will consist of a promenade consisting of an elevated concrete deck which will support numerous structures. At-grade parking will be provided beneath the deck.

Background Information

Melick-Tully and Associates, P.C. (MTA) has previously performed a subsurface investigation for the theater that is presently under construction, as well as for numerous

buildings to be located on the west side of River Road. The results of our previous study were presented in our report of August 5, 1997.

Purpose and Scope of Work

The purpose of our services was to:

1) investigate the subsurface soil and groundwater conditions throughout the proposed promenade area;

2) evaluate the relevant geotechnical engineering properties of the encountered materials;

3) recommend a suitable type of foundation for support of the proposed deck and provide design criteria for the recommended foundation type including estimated lengths and capacities for various types of piles;

4) provide recommendations for the support and subdrainage of the pavement beneath the deck area; and

5) discuss appropriate earthwork operations or considerations for use in the deck area that are consistent with the proposed construction and the encountered subsurface conditions.

To accomplish these purposes, a program of 17 test borings was planned to be performed at the site. The test borings were to be advanced by drilling subcontractors engaged by G. Heller Enterprises. Based on previous work in the area, it was known that the upper fill materials which blanket the site are difficult to penetrate. The boring operations therefore included an initial pre-drilling operation, using a rotary percussion drill rig to advance the borings a depth of approximately 18 to 20 feet. Subsequently, a conventional truck-mounted, hollow-stem auger drilling rig was used to advance the borings below this depth. Due to the procedures that were used to drill the borings, soil samples were usually not obtained in the upper 20 feet of material and sometimes deeper. Also, in several borings, primarily along the extreme southern and eastern portions of the site, the borings were not advanced beyond the pre-drilling stage due to

environmental concerns. These included Borings 10X, 14X, 15X, 16X, and 17X. The approximate locations of the borings are shown on the Plot Plan, Plate 1.

For those borings that were advanced beyond the pre-drilling depth, numerous closely-spaced soil samples were obtained using the procedures of the Standard Penetration Test. Most borings were advanced until refusal was encountered to further penetration with both the soil sampler and the auger drilling equipment.

All field work was performed under the direct technical observation of a geotechnical engineer from our office. Our representative located the borings in the field in relation to survey stakes provided by others, maintained continuous logs of the borings as the work proceeded, and technically supervised the soil sampling operations to develop the desired subsurface information.

All soil samples were brought to our office where they were examined. Detailed descriptions of the encountered materials are shown on the Logs of Borings, Plates 2A through 2S. The soils were visually classified in accordance with the Unified Soil Classification System described on Plate 3.

Based on the results of our subsurface explorations and an examination of the soil samples, we have formulated our conclusions and recommendations. The following discussions of our findings are subject to the limitations attached as an Appendix to this report.

Subsurface Conditions

The subsurface conditions encountered within the borings drilled for this investigation were similar to those encountered previously at this site. All borings encountered a surficial layer of fill that appeared to range from 11 to over 25 feet in thickness. In most explorations, it is believed that the fill contained cobbles, boulders and large concrete fragments. Soil sampling

was not attempted within the fill layer and therefore, the character and components of the fill were estimated from the behavior of the drilling equipment. Variations from the estimated conditions should be anticipated. The soils encountered beneath the fill generally consisted of loose to medium dense silts or sands and in the eastern portions of the site, soft clayey silts. Within the westernmost borings, the silts and sands graded to dense to very dense in consistency after penetrations of approximately 10 to 20 feet into the strata. Refusal was encountered at depths of approximately 30 to 50 feet below the existing grades in the westernmost borings. The borings drilled in the eastern site areas generally encountered soft clayey silts which extended to depths of as much as 110 feet below the existing grades. Beneath the soft silts, stiff to very stiff clayey silt or dense to very dense sands and silts were encountered. Refusal was encountered at depths of approximately 75 to 130 feet below the existing grades in the eastern site areas.

Where refusal was encountered, it is believed that bedrock was present. However, the drilling equipment had difficulty penetrating the bedrock and clear indications of the rock type could not be made. In general, it appeared that the westernmost borings encountered diabase bedrock, while the borings from the western to central portion of the site encountered sandstone and further to the east, the bedrock appeared to be shale or siltstone.

Conclusions and Recommendations

General: The existing fill soils and underlying soft compressible clayey silts in the eastern portion of the site will be unsuitable for support of foundation loads. In our opinion, the foundations must derive their support from the dense to very dense or stiff to very stiff natural soils or underlying bedrock. As the foundation loads are expected to be relatively heavy, we anticipate that it would be most efficient to derive foundation support from the bedrock materials.

It is our opinion that driven piles extending to the underlying bedrock would be the most suitable means of foundation support. As the upper materials contain numerous obstruction, considerable pre-drilling or pre-excavating will be required to advance piles through the fill. To advance piles to the bedrock surface, relatively heavy sustained driving would be required and we therefore believe that a steel H-pile would be the most efficient pile type. In our opinion, steel H-piles driven to practical refusal in the underlying bedrock could be designed for the structural capacity of the pile. For conventional H-pile sizes, it appears that capacities of up to 200 tons per pile would be achievable.

Foundation Design: In our opinion, steel H-piles driven to the bedrock would be the most suitable means of foundation support. Foundations extending to the bedrock could be designed for the allowable structural capacity of the pile. We believe that the piles should be driven with a single-acting hammer delivering a minimum rated energy of at least 23,000 foot-pounds per blow where the piles will be 50 feet or less in overall length and a minimum of at least 32,000 foot-pounds per blow where the piles will be greater than 50 feet in length. The piles should be driven to a resistance of at least 20 blows per inch for three consecutive inches or to refusal. Refusal may be taken as a resistance of 40 blows per inch.

In order to advance the piles through the fill, pre-drilling, spudding or pre-excavating will be required. A typical depth for these operations would be on the order of 20 feet below the existing grades, although it may be deeper at some locations. All piles should be fitted with a driving point, such as Pruyn Point 75750 as manufactured by the Associated Pile and Fitting Corporation. These will aid in preventing damage to the piles when penetrating the fill and when seating the piles in the underlying bedrock.

Depending upon the pile size that is selected, capacities of up to 200 tons per pile will likely be achievable. A minimum of one single pile static load test should be performed using the procedures of ASTM D-1143 with the standard loading procedure.

A minimum of twelve test piles should be driven throughout the proposed deck area to gauge the actual pile lengths that will be required. One of these piles may be selected for the load test.

If fill is placed at the site, it will cause consolidation of the soft clayey silts and subsequent settlement of the silts and overlying fill materials resulting in downdrag loads on the piles. We understand that potential downdrag loads will be evaluated by the structural engineer once grading plans are developed.

Pavement/Utilities: The existing fill soils which blanket the site are generally granular in nature near the surface. Consequently, these materials will provide relatively good subgrade support for pavements. Prior to pavement construction, the surface material should be proofrolled and compacted to a dense and unyielding consistency. Any areas which cannot be compacted to the desired degree should be excavated and backfilled with granular materials.

Although a relatively good subgrade will be available for pavement support, long term settlements may occur due to compression of the soft clayey silts, especially in the eastern portion of the site where these soils are thickest. Potential settlements will vary with the thickness of fill that is placed as well as the thickness of the soft soils. Settlements resulting from these conditions are expected to be gradual and therefore generally should not create serious problems for flexible pavements. One potential serious problem area would be where pavements sit atop buried pile caps. The pile caps will tend to remain fixed while the areas around settle, which could therefore cause an abrupt transition in the surface of the pavement

resulting in cracking. Therefore, extraordinary future pavement maintenance should be anticipated. The simplest means to correct this problem is to remove the pavement from above the pile caps along with some of the underlying soil to lower the grade to that of the adjacent settled areas. The pile cap must therefore be deep enough to accommodate these operations.

Below-grade utilities will settle with the surrounding areas. Therefore, all utilities should be fitted with flexible connections, especially those that connect to the structure and those in the easternmost site areas. Wherever possible, utilities should be hung from the structure.

The following Plates and Appendix are attached and complete this report:

Plate 1 – Plot Plan
Plates 2A through 2S – Logs of Borings
Plate 3 – Unified Soil Classification System
Appendix – Limitations

Respectfully submitted,

MELICK-TULLY & ASSOCIATES, P.C.

Charles T. Melick, P.E.

CTM/psi
4735-036*01
(6 copies submitted)

LOG OF BORING

BORING NO. 1X

SURFACE ELEV.

COMPLETION DATE: 06/28/1999
JOB NUMBER: 4735-036

WATER LEVEL: 11'
READING DATE: 06/28/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling Uneven drilling action to 11' PROBABLE FILL -numerous cobbles and boulders from 6' to 11'
10					
15				ML	Smooth drilling @ 11' Probable clayey silt
20	S	2,1 2,1			-Dark grey clayey silt (soft)
				SM	Dark gray fine sand, little silt (loose)
25	S	1,2 2,10		SP	Gray fine to medium sand, trace silt (loose)
				ML	Gray clayey silt (stiff)
30	S	4,6 9,12		ML	Brown silt, little fine sand (medium dense)
35	S	2,34 32,43 75/0"			Gray-black diabase - highly fractured
40					Boring completed @ 37' Refusal to further penetration with auger @ 37'
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. S INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 2X

SURFACE ELEV.

COMPLETION DATE: 06/25/1999

JOB NUMBER: 4735-036

WATER LEVEL: See Below

READING DATE: 06/25/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION (2) RESISTANCE BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Attempted to drill through fill without sampling Steel obstruction encountered @ 11' - could not penetrate Boring shifted 8' west - See boring 2XA
10					
15					Boring completed @ 11' Water level not recorded
20					
25					
30					
35					
40					
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. ▮ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 2XA
SURFACE ELEV.

COMPLETION DATE: 06/25/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/25/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION (2) RESISTANCE BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling Uneven drilling action to 13' PROBABLE FILL
10					
15				??	Smooth drilling @ 13' - Probable clayey silt
20				SM	Change in drilling action @ 18' - Probable silty sand -Gray-brown fine to medium sand, some silt (medium dense)
		2,4 9,60/3"		ML	Brown silt, little fine sand, little fine to coarse gravel (dense to very dense)
25		22,32 40,40		SM	Light brown fine to coarse sand, little silt, with sandstone fragments (decomposed sandstone) (very dense)
30		2,2 50/3"			-grading with numerous sandstone fragments -Refusal to further penetration with auger @ 35' Probable sandstone bedrock
35		50/0"			Boring completed @ 35' Water level not recorded
40					
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:
1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 3X

SURFACE ELEV.

COMPLETION DATE: 07/02/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 07/02/1999

DEPTH (FEET)	SAMPLES [1]	PENETRATION RESISTANCE [2] BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled without sampling to 20' Uneven drilling action to 13' PROBABLE FILL -Numerous cobbles and concrete fragments from 0' - 5' and 10' - 11'
10					
15				ML	Smooth drilling action @ 13' Probable clayey silt
20	▨	8,6 6,8			-Dark gray clayey silt (medium)
25	▨	3,14 13,14		SP	Light brown fine sand, trace silt (medium dense)
30	▨	0,8 20,21			-grading with some fine gravel
35	▨	10,11 11,17		SM	Light brown fine to medium sand, little silt (medium dense)
40	▨	8,23 32,34		ML	Light brown silt, little fine sand (very dense)
45	▨	9,14 15,19		SM	Light brown fine sand, little silt (medium dense) -grading with diabase fragments - refusal to further penetration with auger @ 48'
50	▬	100/0"			Boring completed @ 48' Water level not recorded
55					
60					
65					

NOTES FOR COLUMNS:

1. ▨ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 4X
SURFACE ELEV.

COMPLETION DATE: 06/28/1999
JOB NUMBER: 4735-036

WATER LEVEL: 8'
READING DATE: 06/28/1999

DEPTH (FEET)	SAMPLES [1]	PENETRATION RESISTANCE [2] BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 30' without sampling Uneven drilling action to 12' PROBABLE FILL -boulders from 3' to 5'
10					
15					Smooth drilling action @ 12' -probable clayey silt
20					
25					
30	▯	0,0 2,1		ML	-gray clayey silt (soft)
35	▯	0,0 0,0			
40	▯	0,0 0,2			
45	▯	0,0 2,2			
50	▯	0,0 3,3			-grading with some fine to medium sand
55	▯	8,27 43,26		SM	Gray fine to medium sand, some silt (very dense)
60	▯	11,12 28,29		ML	Light brown silt, little fine sand (very dense)
65	▯	12,50 33,25		SM	Brown fine to coarse sand, trace silt (very dense)
				SP	Brown fine to coarse sand, trace silt (very dense)

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

(Continued on following page)

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 4X
SURFACE ELEV.

COMPLETION DATE: 06/28/1999
JOB NUMBER: 4735-036

WATER LEVEL: 8'
READING DATE: 06/28/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
					(Continued from previous page)
70		12,50 33,25			Brown fine to coarse sand, trace silt (very dense)
		11,24 39,36			-grading with thin layers of red-brown silty fine sand
75				SP	
80		100/1"			
85		100/3"			-refusal to further penetration with auger @ 85'-6"
					Boring completed @ 85'-6"
90					
95					
100					
105					
110					
115					
120					
125					
130					

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 5X

SURFACE ELEV.

COMPLETION DATE: 07/07/1999

JOB NUMBER: 4735-036

WATER LEVEL: See Below

READING DATE: 07/07/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling. Two attempts required. Initial attempt encountered boulder from 8'to 9', and numerous boulders from 16'to 19' Could not advance deeper than 19'. Relocated and started over. Second attempt encountered boulders from 11'to 14'
10					
15					
20	▮	5,12 3,5			FILL - Black fine to coarse sand, little fine gravel, little silt with occasional boulders
25	▮	14,53 11,10			-Obstruction @ 28' relocated boring 90' to NW - See Boring 5XA
30					Boring completed @ 129' Water level not recorded
35					
40					
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. ▮ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 5XA

SURFACE ELEV.

COMPLETION DATE: 07/07/1999

JOB NUMBER: 4735-036

WATER LEVEL: See Below

READING DATE: 07/07/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION (2) RESISTANCE BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling Uneven drilling action to 18' PROBABLE FILL
10					
15					
20		11,13 16,16		CL	Smooth drilling action @ 18' Probable silty clay -Gray silty clay (very stiff)
25		2,3 3,3		SM/ML	Gray and black fine to medium sand and silt (loose)
30		1,1 2,2		ML	Gray and black silt, little fine sand (loose)
35		0,0 3,4			Gray-black clayey silt (medium)
40		0,2 3,3			
45		2,2 2,2			-trace shell fragments
50		0,5 2,4		ML	
55		0,3 2,3			
60		4,4 4,3			
65		0,0 4,3			

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

(Continued on following page)

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 5XA
SURFACE ELEV.

COMPLETION DATE: 07/07/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 07/07/1999

DEPTH (FEET)	SAMPLES [1]	PENETRATION RESISTANCE BLOWS/6 INCHES [2]	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION (Continued from previous page)
70		0,0 4,3		ML	Gray-black clayey silt (medium)
75		0,0 5,5			
80		0,0 5,3			
85					
90		0,6 6,5			
95					
100		9,9 10,10			
105					
110		75,93 100/5"		ML/SM	Brown silt and fine to coarse sand, little fine gravel (very dense)
115		100/5"		ML	Red-brown silt and fine to medium sand with shale fragments (very dense)
120		100/4"			
125		100/5"			
130		100/0"			Red-brown shale Refusal to further penetration with auger @ 129' Boring completed @ 129' Water level not recorded

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 6X
SURFACE ELEV.

COMPLETION DATE: 06/25/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/25/1999

DEPTH (FEET)	SAMPLES [1]	PENETRATION RESISTANCE BLOWS/6 INCHES [2]	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling Uneven drilling action to 15' PROBABLE FILL Difficult drilling @ 1'-3', 9'-10', & 14'-15' Probable boulders
10					
15					
20	▨	1,2 4,4		ML	Smooth drilling action @ 15' - Probable clayey silt -Gray-black clayey silt (soft)
25	▨	5,9 12,20		ML	Light brown clayey silt, little fine to coarse sand (very stiff)
30	▨	15,35 53/2"		ML	Green-brown clayey silt, little fine to coarse gravel, little fine to coarse sand (very stiff - hard)
35	▨	100/4"		SM	Gray fine to medium sand, little silt, with diabase fragments (very dense) -refusal to further penetration with auger @ 40'
40	▨	25/0"			Boring completed @ 40' Water level not recorded
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. ▨ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 7X

SURFACE ELEV.

COMPLETION DATE: 07/06/1999

JOB NUMBER: 4735-036

WATER LEVEL: See Below

READING DATE: 07/06/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled without sampling to 20' Uneven drilling action to 19' PROBABLE FILL
10					
15					-very difficult drilling from 16' - 19' Probable boulders
20	■	75/1"		SM	Light gray fine to coarse sand, some silt with sandstone fragments (decomposed sandstone)
25	■	75/0"			
30	■	100/0"			-Refusal to further penetration with auger @ 30' on probable sandstone bedrock
35					Boring completed @ 30' Water level not recorded
40					
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. ■ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 8x
SURFACE ELEV.

COMPLETION DATE: 06/25/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/25/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 25' without sampling Uneven drilling action to 11' PROBABLE FILL - Boulders from 0'to 6'
10					
15				??	Smooth drilling action from 11' - 18' Possible clayey silt
20					Less smooth drilling action @ 18' Possible silty sand
25	S	75/5"		SM	Light gray fine to coarse sand, some silt, with occasional decomposed sandstone fragments (very dense)
30	S	80/1"			
35	S	50/0"			-numerous sandstone fragments
40	S	50/0"			Light gray sandstone -refusal to further penetration with auger @ 40'
45					Boring completed @ 40' Water level not recorded
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. S INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 9X
SURFACE ELEV.

COMPLETION DATE: 06/30/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/30/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling Uneven drilling action to 14' PROBABLE FILL -numerous concrete fragments and plastic from 4' - 9'
10					
15				??	Smooth drilling action from 14'to 18' Possible clayey silt
20	▯	4,3 3,1			Less smooth drilling action @ 18' PROBABLE silty sand FILL -FILL - Brown silty sand with cinders, fine gravel
25	▯	3,1 1,1			
30	▯	1,1 1,2		ML	Dark gray clayey silt (soft)
35	▯	0,1 1,1			
40	▯	0,2 1,1			
45	▯	2,2 1,1			-grading with little fine to medium sand
50	▯	3,8 22,17			
55	▯	12,29 34,46		ML	Light brown clayey silt with decomposed sandstone fragments (very stiff)
60	▯	26,100/5"			-grading with numerous diabase fragments
65	▯	42,100/5"		SM	Brown fine to medium sand, little silt (very dense)

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

(Continued on following page)

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 9X
SURFACE ELEV.

COMPLETION DATE: 06/30/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/30/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
					(Continued from previous page)
70		42,100/5"		SM	Brown fine to medium sand, little silt with diabase
		85,50/2"			
75		100/0"			-grading with fragments of red-brown shale refusal to further penetration with auger @ 77'
80					Boring completed @ 77' Water level not recorded
85					
90					
95					
100					
105					
110					
115					
120					
125					
130					

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 10x
SURFACE ELEV.

COMPLETION DATE: 06/25/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/25/1999

DEPTH (FEET)	SAMPLES[1]	PENETRATION[2] RESISTANCE BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5 10 15					Drilled to 20' without sampling Uneven drilling action to 16' PROBABLE FILL -numerous concrete fragments from 0' to 6'
20				??	smoother drilling action @ 16' Possible silty sand
25 30 35 40 45 50 55 60 65					Boring completed @ 20' Water level not observed

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 11X
SURFACE ELEV.

COMPLETION DATE: 06/25/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/25/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT [%]	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling Uneven drilling action to 12' PROBABLE FILL -Numerous cobbles, boulders, concrete fragments from 0' to 6'
10					
15				??	Smooth drilling action from 12' to 17' Probable clayey silt
20	▨	3,3 10,19		SM	Less smooth drilling action @ 17' Probable silty sand -Gray-brown fine to medium sand, some silt (medium dense)
25	▨	6,11 16,18		SM	Light brown fine to medium sand and silt (dense)
30	▨	3,22 52,60/2" 75/1"		ML	Light brown clayey silt (very stiff)
35					Gray-black diabase - highly fractured -refusal to further penetration with auger @ 32'-6" Boring completed @ 32'-1" Water level not recorded
40					
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. ▨ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 12X
SURFACE ELEV.

COMPLETION DATE: 06/29/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 06/29/1999

DEPTH (FEET)	SAMPLES [1]	PENETRATION RESISTANCE [2] BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 20' without sampling
10					
15					
20	▯	9,14 21,100		SM	Light gray and yellow-brown fine to medium sand, little silt (dense)
25	▯	17,22 100		SM/GM	Green-gray fine to coarse sand and fine to coarse gravel, some silt (very dense)
30					
35	▯	100/1"		SM	Light gray fine to medium sand and silt (decomposed sandstone)
40	▯	50/1"			-sandstone fragments
	▯	80/0"			-refusal to further penetration with auger @ 43'
45					Boring completed @ 43' Water level not recorded
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 13X
SURFACE ELEV.

COMPLETION DATE: 07/09/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 07/09/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5 10 15					Drilled to 31' without sampling Uneven drilling to 19' PROBABLE FILL
20 25					Smoother drilling action @ 19' Probable silty sand
30	▬	50/1"		SM	Light gray fine to medium sand, some silt, occasional sandstone fragments (very dense)
35	▬	50/0"			Very hard drilling @ 35' - Probable sandstone bedrock -Refusal to further penetration with auger @ 38'
40 45 50 55 60 65					Boring completed @ 38' Water level not recorded

NOTES FOR COLUMNS:

1. ▬ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 14X
SURFACE ELEV.

COMPLETION DATE: 07/06/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 07/06/1999

DEPTH (FEET)	SAMPLES [1]	PENETRATION [2] RESISTANCE BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5					Drilled to 15' without sampling - 2 attempts required Uneven drilling action - PROBABLE FILL Numerous boulders from 0' to 10'
10					
15					Boring completed @ 15' Water level not recorded
20					
25					
30					
35					
40					
45					
50					
55					
60					
65					

NOTES FOR COLUMNS:

1. 8 INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 15X
SURFACE ELEV.

COMPLETION DATE: 07/06/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 07/06/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5 10 15 20 25 30 35 40 45 50 55 60 65					Drilled to 20' without sampling Uneven drilling action PROBABLE FILL -Numerous obstructions from 4' to 18' Boring completed @ 20' Water level not recorded

NOTES FOR COLUMNS:

1. ▼ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 16X
SURFACE ELEV.

COMPLETION DATE: 07/06/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE: 07/06/1999

DEPTH (FEET)	SAMPLES (1)	PENETRATION RESISTANCE (2) BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5 10 15					Drilled to 18' without sampling Uneven drilling action PROBABLE FILL
20 25 30 35 40 45 50 55 60 65					Boring completed @ 18' Water level not recorded

NOTES FOR COLUMNS:

1. ▯ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

LOG OF BORING

BORING NO. 17X
SURFACE ELEV.

COMPLETION DATE: 07/06/1999
JOB NUMBER: 4735-036

WATER LEVEL: See Below
READING DATE:

DEPTH (FEET)	SAMPLES [1]	PENETRATION [2] RESISTANCE BLOWS/6 INCHES	MOISTURE CONTENT (%)	SYMBOL	DESCRIPTION
5 10 15					Drilled without sampling to 16' Uneven drilling action PROBABLE FILL
20 25 30 35 40 45 50 55 60 65					Boring completed @ 16' Water level not recorded

NOTES FOR COLUMNS:

1. ▮ INDICATES THE DEPTH OF SAMPLER PENETRATION.
2. INDICATES THE NUMBER OF BLOWS FOR EACH 6 INCHES OF PENETRATION TO ADVANCE A 2" O.D. SAMPLER USING A 140 POUND WEIGHT FALLING 30 INCHES.

SOIL DESCRIPTION MODIFIERS:

TRACE	0 - 10%
LITTLE	10 - 20%
SOME	20 - 35%
AND	OVER 35%

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than 50% of material is LARGER than No. 200 Sieve	GRAVEL & GRAVELLY SOILS More than 50% of coarse fraction RETAINED on No. 4 Sieve	CLEAN GRAVELS (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS More than 50% of coarse fraction PASSING a No. 4 Sieve	CLEAN SAND (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.
			SP	Poorly-graded sands, gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS More than 50% of material is SMALLER than No. 200 Sieve.	SILTS AND CLAYS	Liquid limit LESS than 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS	Liquid limit GREATER than 50	MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			PT	Peat, humus, swamp soils with high organic contents

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

GRADATION*	COMPACTNESS* sand and/or gravel	CONSISTENCY* clay and/or silt
% Finer by Weight	Relative Density	Range of Shearing Strength in Pounds per Square Foot

Trace	0% to 10%	Loose	0% to 40%	Very Soft	less than 250
Little	10% to 20%	Medium Dense	40% to 70%	Soft	250 to 500
Some	20% to 35%	Dense	70% to 90%	Medium	500 to 1000
And	35% to 50%	Very Dense	90% to 100%	Stiff	1000 to 2000
				Very Stiff	2000 to 4000
				Hard	Greater than 4000

**Values are from laboratory or field test data, where applicable. When no testing was performed, values are estimated.*

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

APPENDIX

APPENDIX

Limitations

A. Subsurface Information

Locations: The locations of the explorations were approximately determined by tape and compass measurement from survey stakes provided in the field by others. The locations of the explorations should be considered accurate only to the degree implied by the method used.

Interface of Strata: The stratification lines shown on the individual logs of the subsurface explorations represent the approximate boundaries between soil types, and the transitions may be gradual. Strata changes within the upper 20 feet of each boring were estimated from the action of the drilling equipment and variations from the indicated conditions should be anticipated.

Field Logs/Final Logs: A field log was prepared for each exploration by a member of our staff. The field log contains factual information and interpretation of the soil conditions between samples. Our recommendations are based on the final logs as shown in this report and the information contained therein, and not on the field logs. The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and/or tests of the field samples.

Water Levels: Water level readings have been made in the explorations at times and under conditions stated on the individual logs. These data have been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater will occur due to variations in rainfall, tides, temperature, and other factors.

Pollution/Contamination: Unless specifically indicated to the contrary in this report, the scope of our services was limited only to investigation and evaluation of the geotechnical engineering aspects of the site conditions, and did not include any consideration of potential site pollution or contamination resulting from the presence of chemicals, metals, radioactive elements, etc. This report offers no facts or opinions related to potential pollution/contamination of the site.

Environmental Considerations: Unless specifically indicated to the contrary in this report, this report does not address environmental considerations which may affect the site development, e.g., wetlands determinations, flora and fauna, wildlife, etc. The conclusions and recommendations of this report are not intended to supersede any environmental conditions which should be reflected in the site planning.

B. Applicability of Report

This report has been prepared in accordance with generally accepted soils and foundation engineering practices for the exclusive use of G. Heller Enterprises for specific

application to the design of the proposed promenade. No other warranty, expressed or implied, is made.

This report may be referred to in the project specifications for general information purposes only, but should not be used as the technical specifications for the work, as it was prepared for design purposes exclusively.

C. Reinterpretation of Recommendations

Change in Location or Nature of Facilities: In the event that any changes in the nature, design or location of the promenade are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

Changed Conditions During Construction: The analyses and recommendations submitted in this report are based in part upon the data obtained from 17 widely-spaced test borings performed for this study. The nature and extent of variations between the explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

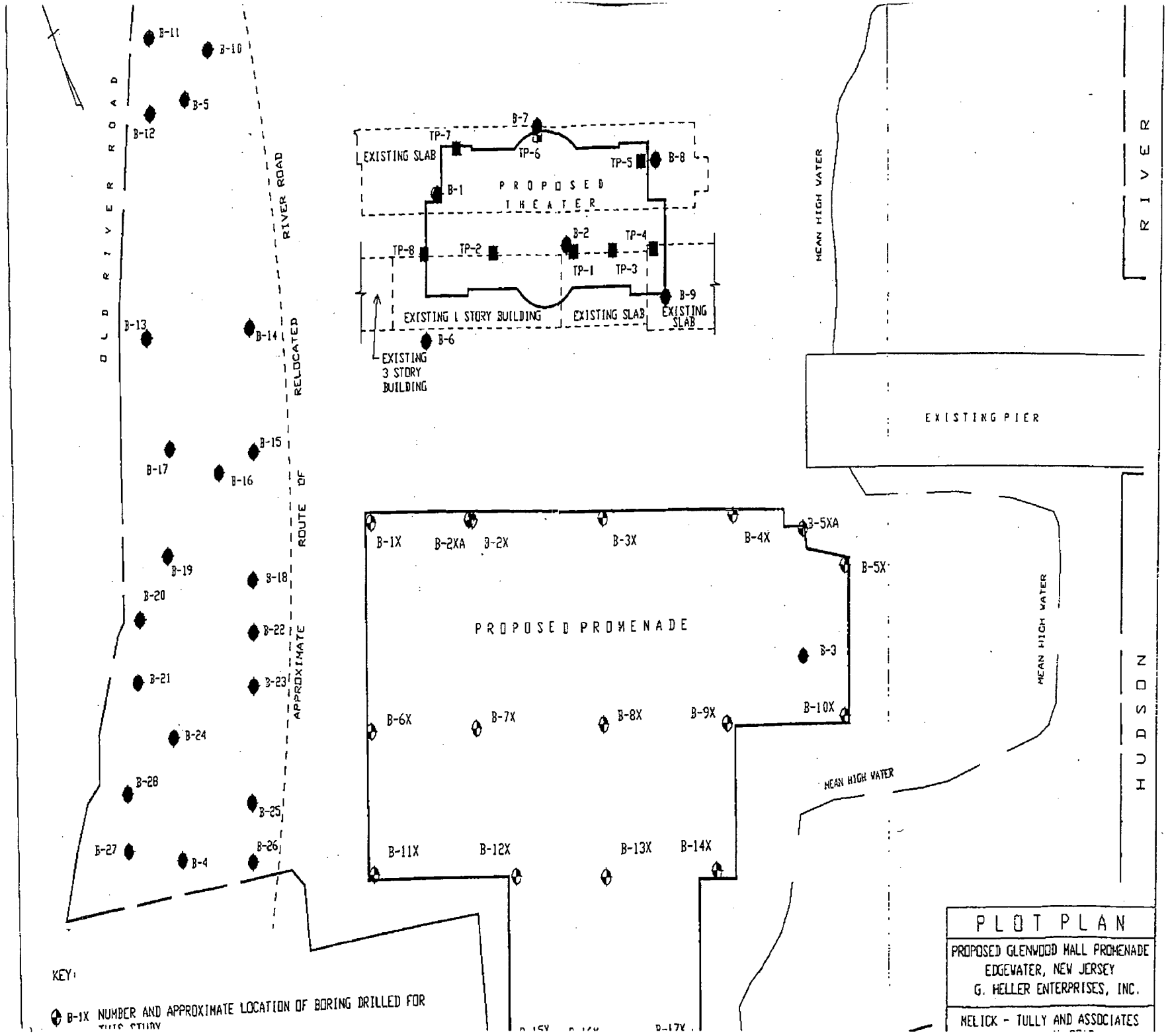
Changes in State-of-the-Art: The conclusions and recommendations contained in this report are based upon the applicable standards of our profession at the time this report was prepared.

D. Use of Report by Prospective Bidders

This soil and foundation engineering report was prepared for the project by Melick-Tully and Associates, P.C. for design purposes and may not be sufficient to prepare an accurate bid. Contractors utilizing the information in the report should do so with the express understanding that its scope was developed to address design considerations. Prospective bidders should obtain the owner's permission to perform whatever additional explorations or data gathering they deem necessary to prepare their bid accurately.

E. Construction Observation

We recommend that Melick-Tully and Associates, P.C. be retained to provide on-site soils engineering services during the earthwork and foundation construction phases of the work. This is to observe compliance with the design concepts and to allow changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.



PLOT PLAN

PROPOSED GLENWOOD MALL PROMENADE
EDGEWATER, NEW JERSEY
G. HELLER ENTERPRISES, INC.

MELICK - TULLY AND ASSOCIATES